ELWHA UAS OPERATIONS

Background. With funding from Reclamation's R&D Office, the Emergency Management and GIS Group at the Denver TSC has partnered with the U.S. Geological Survey to investigate the feasibility of using unmanned aerial systems (UAS) for natural resource and emergency management. Systems such as the Raven and the T-Hawk have recently been made available to the Department of the Interior (DOI) through the National Business Center Aviation Management Directorate. Departmental training and policy development related to the use of unmanned aerial technology is conducted by this directorate (http://amd.nbc.gov/), which oversees all aviation activities within DOI.

The USGS Rocky Mountain Science Center (http://rmgsc.cr.usgs.gov/UAS/) has taken the Departmental lead in evaluating potential uses of UAS. This center has already flown Raven mission to monitor such varied phenomena as wildfire, habitat, wildlife, invasive species, ground water discharge, flooding, and mines. The latest expedition has been to monitor sediment movement in the Elwha River corridor with the assistance of Denver TSC personnel.

The Raven. The Raven is a hand-launched, battery operated, unmanned aerial system that is 36" in length and has a 4.5' wingspan. Its typical operating altitude is 100-400' above ground level with a speed of about 30 mph, and a flight duration length of about an hour. It can carry an electro-optical video or an infrared-thermal video camera system. The USGS is also currently testing the use of a higher resolution GoPro camera on the system. Two persons are required for flight operations of the Raven - one pilots the aircraft; one operates the ground-control station. In addition, one or more trained observers are required to maintain visual line of sight of the aircraft.

Figure 1 The Raven UAS. (Photo Courtesy of Lance Brady)

The Elwha River Restoration. In the year 2000, DOI purchased Elwha and Glines Canyon Dams in preparation for their removal to support river and fish habitat restoration. Approximately 24 million cubic yards of sediment are being

managed as part of the dam removal project. Monitoring the changing topography that occurs as the sediment is eroded and redistributed downstream is critical for adding to the science of dam removal.

In 2011, the Bureau of Reclamation (Reclamation) partnered with Michael Hutt at the USGS National Unmanned Aircraft Systems Project Office to develop a research roadmap for monitoring shifting topography as the sediments from Lake Aldwell and Lake Mills are actively being removed by the rejuvenated Elwha River. It was determined that UAS technology shows promise for capturing imagery of this dynamic system. While Reclamation obtained permits for operations within the Olympic National Park, Susan Goplen of the USGS applied for a certificate of authorization from the FAA, which is required to operate an unmanned vehicle in US air space.

In June of 2012, the first of two flight operations began with two USGS personnel, Jeff Sloan and Mark Bauer, and one BLM staff member, Lance Brady, piloting the aircraft and manning the ground station. Douglas Clark and Alan Bell from Reclamation observed the operation to determine if the technology can provide USBR with valuable new mapping capabilities. Andrew Ritchie of the Elwha Field Office provided NPS oversight. The next Elwha missions will occur in late September of FY12. In total, 14 missions were flown and nearly sixty gigbytes of raw video was taken (See figures 2 and 3). These remotely sensed data are currently being processed to provide ortho-rectified imagery to monitor sediment change in this highly dynamic system. (See also http://rmgsc.cr.usgs.gov/UAS/BoRriverSedimentMonitoring.shtml) .

Figure 2 Ongoing Sediment Removal on the Elwha River. Video frame taken from the Raven in June, 2012

Figure 3: Dam at Glines Canyon. Video frame taken by the Raven in June, 2012.

At the same time Reclamation and the USGS continue to learn about, and come to terms with the strengths and limitations of UAS technology-- with a view toward identifying discrete niches of use for accomplishing various DOI agency missions.

Other UAS Efforts. Jade Soddell, an emergency management specialist and meteorologist with the Emergency Management and GIS Group, is working on a parallel project with the USGS to examine the utility of a hovering craft called the T-Hawk for natural resource and emergency management. Soddell and Clark have partnered with David Fisher, manager of the group, to submit an R&D proposal in FY2013 to test the utility of the T-Hawk, the Raven, and the Homeland Security Predator for security and emergency management operations. Soddell and Clark are also currently developing a UAS SharePoint site that will be launched in early August 2012.